DOCUMENT RESUME

ED 196 936 TM 810 051

AUTHOR Hill, Kennedy T.
TITLE Eliminating Motivational Causes of Test Bias. Final Report, October 1, 1976 through March 31, 1980.
INSTITUTION Illinois Univ., Urbana. Inst. for Child Behavior and Development.
SPONS AGENCY National Inst. of Education (DHEW), Washington, D.C.
PUB DATE 31 Mar 80
GRANT NIE-G-76-0086
NOTE 51p.

EDRS PRICE MF01/PC03 Plus Postage.
DESCRIPTORS *Achievement Tests; Elementary Education; *Motivation; Racial Differences; Sex Differences; Socioeconomic Influences; *Test Anxiety; *Test Bias; *Test Construction; *Testing Problems; Testing Programs; Test Wiseness
IDENTIFIERS Testing Conditions

ABSTRACT

This program of research has three general thrusts. First, the relations between motivation and achievement performance were studied across children of various sociocultural backgrounds including lower- and middle- class white, black, and hispanic children. Motivational test bias was found to be strong for students of all sociocultural backgrounds, income levels, and public school age levels. As an outgrowth of this research, new, shorter motivational measures were developed. A second thrust was a series of studies directed at developing new procedures for giving (achievement) tests that successfully reduce or eliminate motivational aspects of test bias and thereby optimize children's performance. Time limits in particular can be varied in completely standardized ways in administering achievement and other tests so that procedures found to minimize motivational bias and optimize performance can be fairly readily incorporated into testing programs. The third thrust of the research program was to help children learn to cope with and function effectively in highly evaluative formal testing situations through the development of additional new kinds of practice tests and teaching activities that help students deal with test instructions and procedural demands. (RL)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED196936

U S DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

FINAL REPORT

Grant Title: Eliminating Motivational Causes of Test Bias

National Institute of Education

Grant Number G-76-0086

Project Director: Dr. Kennedy T. Hill
Professor of Psychology and Educational Psychology
147 Institute for Child Behavior and Development
University of Illinois
51 Gerty Drive
Champaign, Illinois 61820

(217) 333-1354 or 333-6577 (messages)

Grant Period: October 1, 1976 - March 31, 1980

The research reported herein was performed pursuant to a grant contract with the National Institute of Education. Contractors undertaking such projects under government sponsorship are encouraged to express freely their professional judgment in the conduct of the project. Points of view or opinions stated do not, therefore, necessarily represent official National Institute of Education position or policy.

Fifteen copies sent to: Ms. Karen Mitchell
National Institute of Education
1200 19th Street, N. W., Room 822
Washington, D. C. 20208

(202) 254-6271

1 IM 818 257

Table of Contents

I. Summary 1

II. General Background 3

Overview 3

The Role of Motivation in Testing 3

A Model for School-University Research 4

Research Goals 6

Theoretical Background 7

Measurement 8

III. The Program of Research 10

Relation of Anxiety to Achievement 10

Measurement of Test Motivation 12

Developing Optimal Testing Conditions 14

Time Pressure, Failure, and Test Taking Strategies 16

Cognitive Testing Demands Independent of Contents 26

IV. Implications for Education Testing Policy 30

General Comments 30

Assessment of Motivation in Testing Programs 30

Modifications in Testing Procedures 31

Development of New Testing Programs 34

Development of New Teaching Activities and Integrated Testing Programs 36

V. References 38

VI. Appendix 42

Contents of Appendix 42

Tables 44

Figures 46

Full Length Papers from Grant . . . . . Attached

I. Summary

This final report reviews a program of research supported from October 1, 1976 - March 31, 1980 by NIE Grant 76-0086. The research builds on previous studies suggesting increasingly strong negative relationships between debilitating motivational factors such as test anxiety and achievement test performance across the elementary school years. This literature suggests that these debilitating motivational processes are an important source of test bias which causes achievement and other forms of educational tests to increasingly underestimate the skills and learning of test anxious, failure-prone children as they become older. More generally, negative motivational factors may weaken the validity of any achievement, diagnostic, or program assessment instrument given under highly evaluative conditions. The development of testing procedures and programs that minimize or eliminate motivational sources of test bias, then, should produce more valid and useful test results for assessing educational practices, for school district evaluations, and for other forms of program evaluation, as well as for diagnostic and prognostic purposes with individual students.

The program of research has three general thrusts. First, the relations between motivation and achievement performance are studied across children of various sociocultural backgrounds including lower- and middle-class white, black, and hispanic children. Motivational test bias was found to be strong for students of all sociocultural backgrounds, income levels, and public school age levels. As an outgrowth of this research, new, shorter motivational measures were developed later in the project.

A second thrust in the program of research is a series of studies directed at developing new procedures for giving (achievement) tests that

successfully reduce or eliminate motivational aspects of test bias and thereby optimize children's performance. Emphasis in these studies is placed on removing time pressure, providing information about the level of difficulty of the test, and the teaching of test taking strategies. Removal of time pressure was found to be particularly effective in optimizing the performance of high anxious-failure prone students. Time limits in particular can be varied in completely standardized ways in administering achievement and other tests so that procedures found to minimize motivational bias and optimize performance can be fairly readily incorporated into testing programs.

The third thrust of the research program is to help children learn to cope with and function effectively in highly evaluative formal testing situations through the development of additional new kinds of practice tests and teaching activities that help students deal with test instructions and procedural demands. The goal here is to teach children test taking skills--for example, how to balance demands in many testing situations for both speed and accuracy. Our initial efforts in this area suggest that some of these test taking skills can be modified just before introducing an (achievement) test while others need to be taught in the classroom over time.

After a review of grant supported research carried out in each area, implications of the research for educational testing policy are discussed in some detail.

II. General Background

Overview

The role of negative motivational factors has only recently been given much attention in education and testing circles. Motivational factors, however, may be a very important source of test bias (Dweck, 1977; Hill, 1972, 1980; Maehr, 1977). The program of NIE supported research reviewed here is directed at identifying and eliminating specific motivational causes of test bias for children of all ethnic and socioeconomic backgrounds. Earlier research revealed increasingly strong interfering effects of negative motivational variables such as test anxiety on school and achievement test performance across the public school years (see Hill & Sarason, 1966; Ruebush, 1963). The experimental and field research reviewed here is suggesting ways of preparing children for and giving achievement tests which minimize negative motivation and optimize test performance (Hill, 1972, 1977). The ultimate goal of this research is long lasting student gains in both positive motivation and test performance (Hill, 1980).

The Role of Motivation in Testing

There is increasing evidence that the performance of children on achievement and other school tests is strongly influenced by motivational and other test taking factors (Hill, 1977). It has been found, for example, that by the end of the elementary school grades high test anxious children are, compared to low test anxious children, over two years behind in reading and arithmetic basic skills test performance (see Hill & Sarason, 1966). Ongoing research (Willig, Harnisch, Hill, & Maehr, 1980) indicates that the interfering effects of negative motivation on (achievement) test performance are quite strong for low income/minority as well as for other highly test anxious children. These

students often become anxious and do not perform well under test pressure and have difficulty showing what they have learned in standard achievement test situations.

Motivational test bias should operate in any highly evaluative educational test situation (Hill, 1977). Research from this project suggests that the way many standardized tests are composed and given do, in fact, elicit or at least allow strong debilitating motivational dynamics such as test anxiety to operate (Hill, 1980; Zigler, Abelson, & Seitz, 1973). Such motivational test bias will cause many children to perform well below their optimal level of functioning in the test situation, thereby invalidating their results if one is interested in what the children have learned, as opposed to whether they can demonstrate that learning under heavy testing pressure.

The recent, renewed emphasis on achievement testing and the introduction of new evaluation programs such as minimal competency testing should make motivational test bias an even stronger factor in the assessment of student's achievement (Hill, 1980). As the consequences of doing poorly or failing a test become more serious (not being promoted, not graduating, etc.) and more public, test pressure and negative motivational dynamics should become stronger. It becomes increasingly important to identify and eliminate motivational causes of test bias through the development of new teaching and testing programs.

A Model for School-University Research

The present project on motivation and evaluation involves a new kind of research approach which we refer to as collaborative school-university research. The research focuses on the development of specific new educational evaluation practices in the areas of (achievement) testing which optimize

children's motivation, learning, and performance. The general approach, however, is a model for better integration of psychological/educational research and educational practice (see Hill, 1980).

Recent and ongoing research is a collaborative effort among school staff and university personnel in several ways. The areas to be studied are identified by both school and our project staff as being worthy of extensive study. Sometimes school staff take the initiative in developing the research as in the case of development of new school testing programs, and sometimes we take the initiative, as in the case of several projects developing optimal ways of giving achievement tests. Projects tend to evolve over time with reciprocal involvement at all phases of the research.

As would be expected from the strong mutual interest of school and university staff in such research activities, our project involves elements of what have traditionally been identified as basic and applied research, which in our case have been woven together into collaborative school-university research.

The research is basic in a number of ways. Projects draw heavily upon both theory and findings in psychological and educational research and are directed at clarifying processes mediating effects of evaluation. Collaborative projects also draw heavily upon the procedures, measuring instruments, design, and analysis techniques from basic research literatures. The research in general draws upon experimental, systematic assessment, and field research paradigms and procedures as appropriate.

The collaborative school-university projects are also applied in nature. Most importantly, they focus on educational issues and problems of direct relevance to the school staff--for example, how to give school or standardized achievement tests so that positive motivation and test taking strategies

facilitate optimal test performance. Portions of the projects are specifically directed at helping schools develop and document new school evaluative practices which help optimize students' learning and motivation. These collaborative endeavors serve as one model for how public school staff and university researchers can work together on projects which simultaneously advance our basic knowledge and develop specific new educational practices which help solve basic problems in American education, e.g., how to eliminate motivational test bias.

Research Goals

The program of research has had three general goals:

First, the relations between motivation and (achievement) test performance were systematically studied for children of various sociocultural backgrounds and ages, including lower- and middle-class white, black, and hispanic children.

Second, a series of studies were carried out directed at developing new procedures for giving diagnostic and achievement tests that reduce or eliminate motivational aspects of test bias and thereby optimize children's performance. Emphasis in these studies was placed on removing time pressure, systematic failure, and unnecessary cognitive demands of the test independent of its content. These parameters can all be varied in completely standardized ways in administering achievement and other tests, so that procedures found to minimize motivational bias and optimize performance can be incorporated into testing programs without undue difficulty.

Third, the project was designed to help children learn to cope with and function effectively in highly evaluative formal testing situations through the development of additional new kinds of instructional procedures. One goal here is to teach children test taking skills--for example, how to balance

demands in test situations for both speed and accuracy. Performance of anxious, failure-prone children may be further optimized by modifying and making more realistic children's expectancies for success-failure and for later adult evaluation. Modifying children's perceptions and performance strategies is thus a complex process. Some of these test taking skills can be modified just before the (achievement) test situation while others need to be taught in the classroom over time.

Theoretical Background

The research reviewed here is most related to the research literature on achievement-related motives in children (Smith, 1969; Spielberger, 1972). Research in this area was largely stimulated by the work of Sarason and Atkinson. Sarason and his colleagues (Sarason, Davidson, Lighthall, Waite, & Ruebush, 1960) developed theory and considerable data relating test anxiety in children to achievement and other test performance. Emphasis was placed on parent-child interactions in the preschool and elementary school years and evaluative aspects of the school situation. High test anxious children develop a strong fear of failure, become very cautious in certain situations, and become overly dependent on adult approval (see also Crandall, 1967; Zigler & Harter, 1969).

Atkinson (1964) developed a theory of anxiety and achievement behaviors in which test anxiety is equated with the motive to avoid failure and achievement motivation is equated with the motive to approach success. Research has indicated that achievement-oriented individuals with a stronger motive to approach success than to avoid failure approach tasks of intermediate risk, persist in evaluative situations, and do better on achievement tests and in other problem-solving situations (Atkinson & Feather, 1966; Atkinson & Raynor, 1974).

High anxious children and adults avoid achievement situations, do poorly in test situations, and quit in the face of failure (Dweck, 1975).

The theory (Hill, 1972, 1977) which guides the program of research described here combines elements of the Sarason and Atkinson formulations with additional assumptions and emphases. It is assumed that low anxious children have stronger motives to approach success and obtain approval than to avoid failure and avoid disapproval. These children should do quite well in evaluative, test situations. It is assumed that both approach and avoidance motives increase at higher levels of anxiety but with greater increases for avoidance motives. Thus high anxious children have stronger motives to avoid failure and disapproval and weaker (but still fairly strong) motives to approach success and approval. High anxious children should do poorly in testing situations in which failure is likely or quite possible, but may do quite well in achievement situations in which the possibility of failure and adult disapproval are minimized (see Dusek & Hill, 1970). In general, anxious children should rely more on adult evaluation, while less anxious children should be more willing to evaluate the outcome of their achievement activities on their own (see Hill, 1976; Sarason et al., 1960; Zigler & Harter, 1969). Both success/failure and approval/disapproval are seen as critical to the effects of achievement related motives in children, consistent with Crandall's (1967) formulations. Also important are children's attributions for their successes and failures (Weiner, 1977).

Measurement

In the general research literature and the program of research reported here, children's motivation in achievement test situations has been assessed by self-report measures used successfully in a number of studies (see Atkinson & Raynor, 1974; Hill, 1977; Ruebush, 1963). Student's test anxiety

is measured by the 30-item Test Anxiety Scale for Children (TASC) and the Defensiveness Scales (primarily the 11-item Lie Scale for children, LSC) developed by Sarason and his colleagues (See Sarason, Hill, & Zimbardo, 1964). Both scales are used because research has shown that the self reports of highly defensive children, who usually report low test anxiety, are of doubtful validity (see Hill & Sarason, 1966). A shorter (7 or 14 item) relaxed form of the TASC was also developed in the present research project as will be discussed shortly (Harnisch, Hill, & Fyans, 1980, see Appendix).

III. The Program of Research

Let us now turn to the collaborative school-university research program focusing on new testing and test-preparation activities developed through the support of this grant. These studies, in turn, (along with other research) are a basis for many of the suggestions concerning educational testing policy discussed later in this final report. Detailed reviews of the research supported by this grant are also provided by two major papers coming from the grant in its early (Hill, 1977) and later (Hill, 1980) phase of development (see Appendix).

Relation of Anxiety to Achievement

It has been known for some time that there are strong relationships between test anxiety/achievement motivation and performance on achievement and other educational tests (Atkinson & Raynor, 1974; Ruebush, 1963; Sarason, et al., 1960). In one of the most comprehensive studies, Hill and Sarason (1966) followed some 750 children across the elementary school years in a five-year longitudinal project. Anxiety increased steadily for all groups between first and sixth grade. The negative correlation between anxiety and achievement test performance also increased steadily, approximating -.4 to -.5 by the end of the elementary school years.

Much of this early research relating motivation to achievement focused on white and middle class students (see Ruebush, 1963). There have been studies examining the general relationships between sociocultural variables and school achievement but without a major focus on motivation (e.g., Coleman, et al., 1966; Jencks, et al., 1973; cf. Shea, 1976). These studies have provided strong evidence that sociocultural factors are of major importance in the determination of general school achievement.

In research supported by this grant, Willig, Harnisch, Hill, and Maehr (1980, see Appendix) studied the effects of test anxiety (and attributions) on achievement test performance for 365 mostly low-income black, white, and hispanic students in grades 4 through 8 in a school system with a bilingual program. In general, highly significant ($p < .001$) differences were found among black, white, and hispanic students in reported test anxiety. At both the elementary (grades 4-6) and junior high school (grades 7-8) levels, test anxiety was found to be highest among hispanic students (in both general education and bilingual programs), intermediate for black students, and lowest for white students (see Hill, 1980).

We also found strong negative correlations between test anxiety and performance on a standard arithmetic computation test for black, white, and hispanic students, especially for hispanic children in the bilingual education program whether they were born in Illinois or elsewhere and had moved to Illinois. As can be seen in Table 1, at the late elementary school level, white students in the general education program and hispanic students in the bilingual (all measures given in Spanish) but not the general education programs (all tests given in English) show significant negative correlations

---

Insert Table 1 about here

---

between test anxiety and test performance. By the junior high school level (grades 7-8), all five groups of black, white, and hispanic students in the general and the bilingual educational programs show strong (median correlation of -.45) negative correlations. Similar findings relating high test anxiety (but not success-failure attributions) to low test performance were found in a multiple regression analysis (see Willig, et al., 1980, Appendix).

Measurement of Test Motivation

The focus of a recent study in this project was improving the measurement of test anxiety, already shown to be one of the most important motivational predictors of test performance among students in the elementary through high school grades (Harnisch, Hill, & Fyans, 1980, see Appendix). In order to fully develop effective teaching and testing programs that eliminate motivational test bias in educational testing, however, it becomes important to increase the accuracy and efficiency with which we measure negative test motivation. Although the shorter scales validated in the present research were developed too recently to be used in most of the research supported by the present grant, these scales show great potential for future use as discussed just below (see Harnisch et al., 1980).

The focus of this second study was to develop a shorter, more reliable and valid measure of test anxiety, thus furthering the predictive, diagnostic, and test program uses of test anxiety with students of different sociocultural backgrounds. Although a large number of studies have had successful results with the use of the 30-item Test Anxiety Scale for Children (TASC) developed by Sarason and his colleagues (see Sarason, Hill, & Zimbardo, 1964), the scale has not been subjected to extensive internal analysis of each item's corrected correlation with the total score for the scale. Both a nervous (Do you worry a lot while you are taking a test?) and a relaxed (Do you feel relaxed before you take a test?) form of the TASC are available with predominant use being made of the nervous form (see Feld & Lewis, 1969; Hill, 1980).

Twelve items from the 30-item form of the relaxed TASC were administered with the 1978 Illinois Inventory of Educational Progress (IIEP), a statewide survey of achievement of some 6300 students in grades 4, 8, and 11 carried out by the Illinois State Board of Education. In this collaborative project, the

12-item relaxed TASC was examined for its reliability coefficient (Cronbach's alpha) and for detection and removal of items correlating low or even negatively with the total score at each of the grades.

Reliability coefficients were also computed with a subset of 7-items from the 12-item scale which, as will be seen shortly, showed greater internal consistency. Correlations of both scores (resulting from the sum of the 12-item and of the revised subset of 7-items) with achievement variables were examined to test for possible increases in predictive validity.

In addition to the statewide random survey, two cooperating elementary schools within one district administered the 30-item form of both nervous and relaxed TASC forms (N = 716). Reliability coefficients were computed for the 30-item nervous TASC, 30-item relaxed TASC, 12-parallel items on the nervous TASC form that were administered in the state sample and the same 12 relaxed items from the 30-item relaxed TASC.

The 7-item subscale identified from the statewide 12-item scale increased the Cronbach alpha reliability coefficient from .45 to .70 as well as enhancing validity coefficients with achievement tests (N = 6300). The shorter, more reliable, and more predictive Relaxed Anxiety Scale ("comfort index") can be used in future research to assess, diagnose, and help eliminate negative motivational test bias for students of all sociocultural backgrounds in district, state, and national testing programs.

A replication/validation of these same seven items from the 30-item nervous and relaxed form of the Test Anxiety Scale for Children was found at the local district level (N = 716), providing further evidence of the high reliability of the scales. Moreover, we suggest that an additional seven items from the school district administered relaxed form which were not given at the state level could be added to the original seven items to form a

suggested 14-item comfort index scale which may prove to be an even more powerful but still fairly short measure of test motivation.

The successful development of such shorter, reliable, and valid motivational scales has enormous implications for statewide and district testing and for diagnosis by teachers and other school personnel. The revised scale can be used to (1) assess the strength and nature of negative motivation on test performance, (2) identify children for whom achievement motivation is underestimated by standard testing procedures, (3) diagnose children having test taking problems who would benefit from educational programs teaching students how to cope with testing, and (4) help assess the effectiveness of new testing procedures and programs designed to eliminate motivational test bias. Thus, obtaining a measure of a student's test anxiety (in addition to the student's profile of achievement) should serve as a useful educational indicator in a variety of ways. Shorter, improved motivational measures not only can yield greater reliability and validity than existing scales but also are a more economic and efficient use of student time, making them more likely to be adapted for use by school districts, state assessment programs, and standard testing programs that share our concern for the harmful effects of motivational test bias (Harnisch, Hill, & Fyans, 1980, see Appendix).

Developing Optimal Testing Conditions

It is clear from the research just reviewed that negative motivation is related to low test performance for students of many sociocultural backgrounds on most (highly evaluative) achievement and other educational tests. A critical question immediately arises as to what is the causal underpinning of this correlation? Is it the case that negative motivation (such as test anxiety) modifies students' behavior in ways which lower school and test performance, so that anxiety is the causal factor? Or does a history of failure

in school and on previous tests make students anxious, fearful, and experience other negative motivational tendencies in highly evaluative situations such as the achievement test? Here low achievement would be the causal factor in the motivation-achievement test performance correlations. It is also possible, of course, that other variables influence both motivation and achievement test performance.

One of the major reasons to develop optimal testing conditions designed to minimize any effects of negative motivation and thereby produce optimal performance is, in fact, to test the hypothesis that test anxiety (and other forms of negative motivation) cause low performance in evaluative situations. If high test anxious students show immediate, strong gains in optimizing testing conditions, it is clear they possess the knowledge, skills, and achievement being measured by the test but cannot, due to motivational and other test taking problems, show what they know under standard testing conditions. Here test anxiety is causal to low test performance.

The development of optimal testing conditions does more than allow for a test of the causality in the anxiety-performance correlations. A second major basic research function of optimal testing conditions is to determine which specific motivational factors interact with which specific testing parameters to determine (achievement) test performance. A third critical reason for developing optimal testing conditions is to be able not only to spell out the implications of research for educational testing policy but also to test these implications directly. One of the long term goals of the research program is to develop specific recommendations for educational testing policy based on empirical research which result in more valid and useful educational testing and assessment programs. Let us turn now to research suggesting which

testing parameters might be changed to minimize motivational test bias and provide an optimal estimate of a student's knowledge and skills.

Time Pressure, Failure, and Test Taking Strategies

One of the hallmarks of most achievement tests is that they are given under time limits which generally do not allow all children to finish. Even when most children or older students "finish" a test by trying most problems, it does not necessarily mean that they had sufficient time to do all of the problems adequately. Time pressure is greater at some ages than others. In the elementary school years, for example, children in grades 4 through 6 are often given the same test with the same time limits. This obviously will make the test more difficult for 4th graders than 6th graders and increase the time pressure on the younger children. Some of the aptitude and achievement tests at the high school level have even stricter time limits so that a fair proportion of students taking the test fail to finish. Time limits may create a strong, pervasive pressure that provokes strong negative motivational dynamics in the test situation, particularly for anxious students with a history of performing poorly on tests.

The position we are coming to take is that achievement tests with stringent time limits do not just measure what skills children have acquired or what they know but in addition whether or not they can demonstrate this knowledge quickly and under time pressure and testing stress. The result is that tests given under time pressure can systematically underestimate performance of high anxious-low performing students.

A series of studies supported by the grant have examined effects of time pressure on elementary school childrens' test performance. Hill and Eaton (1977), in an initial study supported by an earlier grant (OEG-0-72-0882)

and revised for publication during the current grant (see Appendix), studied the effect of time pressure on fifth and sixth grade children's performance on basic arithmetic computational tasks which presumably had been mastered several years earlier. Children performed individually either in a "Mixed Success-Failure Condition" involving time limits that allowed for completion of two-thirds of the problems attempted (while a bell indicated time was up on the other third) or in a "Success Only Condition" in which children were allowed to finish all of the problems. The mixed success-failure condition thus involved stringent time pressure, both as perceived and experienced by the child.

The major results from this study are presented in Figure 1 which shows the completion time (rate) and percentage of problems without errors (accuracy) for high (HA), middle (MA), and low (LA) anxious children tested in each of the two conditions. High performance, then, is at the top of the Y-axis. The data have thus been replotted from the original report (see Hill & Eaton, 1977, Figure 1, p. 208) to facilitate comparisons with other data presented here.

Insert Figure 1 about here

As can be seen in Figure 1, in the mixed Success/Failure Condition involving time pressure and one-third failure, high anxious children showed weaker performance than their less anxious counterparts, making errors on three times as many problems, even though they were taking twice as much time on each problem attempted. In contrast, in the Success Only Condition the high anxious children caught up to the less anxious children, working almost as fast and getting just about as many correct.

The results indicate that motivational and test-taking difficulties rather than learning or ability deficiencies may underlie and bias the poor test performance of high anxious children on standardized tests given under stringent time limits. Middle anxious children, as we had expected, tended to show smaller debilitating effects of negative motivation and hence smaller gains under optimal testing conditions than high anxious children.

Eaton (1979) has extended the Hill and Eaton (1977) findings to a new sample of children for whom test anxiety measures were available for the two years prior to testing as well as the current year. Using similar testing conditions, Eaton found that change in anxiety over three years related significantly to performance in the standard and optimizing condition in the direction predicted from the earlier study. Children increasing in anxiety performed poorly in the mixed success-failure condition involving time pressure but much better in the success-only optimizing condition. Conversely, children decreasing in anxiety performed quite well in the mixed success-failure condition but somewhat less well in the success-only condition. Thus children becoming high or low test anxious in the Eaton (1979) study performed in much the same way with and without time pressure as the high and low anxious children in the Hill and Eaton (1977) experiment.

Plass and Hill (1980, see Appendix) have further extended the Hill and Eaton work on time pressure toward actual educational testing practice in a major study with several new features supported by this grant. First, 3rd and 4th grade children were tested in small groups of 6-8 students to achieve group dynamics more similar to classroom testing. Second, the actual problems used were developed with the help of classroom teachers based both on algorithms used in classroom teaching materials and on problems found in several currently used achievement tests appropriate for middle elementary school

students. The particular problems used were verbal mathematics problems which tested the four basic mathematical operations of addition, subtraction, multiplication, and division. The correlation between the percentage correct of subjects in the standard time pressure condition and the performance of these same subjects on a full scale achievement test was .75 ($p < .001$), uncorrected for reliability, suggesting that the set of problems and standard testing condition is a highly comparable analog of an actual standardized achievement test.

The major result of the Plass and Hill (1980) study involves the highly significant triple interaction ($p < .001$) among test anxiety, time pressure condition, and sex, the means for which are presented in Figure 2. There are two major components of this interaction. First, under time pressure, low test anxious children perform better, as expected, than middle and high anxious children for both boys and girls, but with somewhat stronger differences for boys. Second, in the condition removing time pressure, strong optimizing effects are obtained for boys but not for girls. For boys, high test anxious (as well as middle test anxious) students catch up completely and perform as well as low test anxious boys (who show a small decrement). This indicates that high anxious boys are capable of performing well on achievement test arithmetic problems under group testing if time pressure is

---

Insert Figure 2 about here

---

removed from the situation in a testing procedure very closely approximating the full scale achievement test situation. As can be seen in Figure 2, low and middle anxious girls show some optimizing effects without time pressure but high test anxious girls show a non-significant decrement in performance.

It is not clear why girls show smaller interfering effects of anxiety (than boys) under time pressure nor why girls fail to show the expected optimizing effect when time pressure is removed. It should be noted that both the interfering effects of anxiety and the effectiveness of optimizing conditions have generally been strong for both boys and girls across a variety of tests and evaluative situations (Hill & Sarason, 1966; Hill, 1980). Additional research is needed to determine the reliability of the present sex difference.

In order to better understand how anxiety interferes with performance in standard testing conditions and how the removal of time pressure changes these dynamics, Plass and Hill examined children's test-taking rate and accuracy strategies in each condition. The results obtained in these analyses were quite clear cut and helped explain performance of the various anxiety groups tested with or without time pressure. Table 2 presents the number of children of each anxiety level in each condition who showed a fast, medium, or slow response rate and a high, middle, or low level of performance accuracy (based on 20% - 60% - 20%, approximately one standard deviation, cut offs for each dimension). As can be seen, different anxiety groups show quite different strategies. Looking first at children tested under Time Pressure,

---

Insert Table 2 about here

---

nearly all of the low anxious children (19 of 25 children) show an intermediate rate and either a middle or high accuracy level. These children appear to get right on task and proceed through at a steady but not too rapid rate and do quite well on the test. Middle anxious children, in contrast,

tend to perform at an intermediate level of accuracy (16 of 23 children) and show a slight tendency to go at a slow (6) or medium (6) rather than a fast (4) rate. Many high anxious children (18) also show moderate performance accuracy and either a slow (7) or intermediate (10) rate, while other high anxious children (8) perform poorly (boys in particular) but while showing a rapid or intermediate rate (see Plass & Hill, 1980).

In summary, low anxious children perform at an intermediate rate and do quite well, middle anxious children perform more slowly (and cautiously) and do fairly well, and (some) high anxious children perform quite rapidly and do least well as a group. It is possible that middle anxious children are more concerned about making mistakes and hence follow a slow, cautious strategy, whereas high anxious children may be trying to keep up with other children in testing situations and hence adopt the fast, inaccurate strategy referred to earlier. As can also be seen in Table 2, the removal of time pressure does not affect the strategy distributions greatly but if anything seems to have improved performance by reducing somewhat use of the fast-less accurate strategy, especially for boys (see Plass & Hill, 1980). These strategy results are particularly important because they suggest both what maladaptive strategies underlie the low performance of anxious children in standard testing conditions and what kinds of new strategies might be taught these children to help them perform optimally in any testing situation.

The next optimizing study in the program of research supported by the grant (Hill, Wigfield, & Plass, 1980, see Appendix) extended our work on motivational test dynamics to the actual naturalistic test setting. The study was conducted as part of the achievement testing program of a junior high school, and thus the basic test administration reflects how achievement tests are typically given in classrooms. The study, then, allowed us to assess

whether results of the previous individual and small group testing studies are generalizable to actual school achievement testing programs. Further, doing the testing with junior high school students allowed us to examine motivational (test anxiety) influences and optimizing testing procedures at a point in development not often studied in this area.

Specifically, we examined how different kinds of testing instructions and testing procedures would influence children's performance on achievement tests as a function of their level of test anxiety. The optimizing procedures were designed based on the results of the research findings discussed above and on testing procedures the cooperating school was developing. The two variables chosen for study are time pressure and instructional information about the difficulty level of the test problems.

The study was conducted with 7th and 8th grade students of the junior high school (N = 168). At each grade level, students were assigned at random by classroom to one of four testing conditions while taking two subtests of the Comprehensive Test of Basic Skills (Level 3, Form S)--reading comprehension and mathematics computation.

The four testing conditions were structured as follows. In condition 1 (Standard Condition), test company instructions were given, and children did each subtest under test company time limits. This condition was included as a control to establish a performance baseline. In the three optimizing conditions, testing procedures and instructions were varied, except that in each condition children were told to work hard and avoid getting stuck on difficult items. In condition 2 (Relaxed Time Limits), shorter versions of the subtests were given but with the usual time limit. This was accomplished by deleting approximately one-half of the items from each subtest.

In condition 3 (Difficulty Information), children received special instructions designed to reduce evaluation pressure. For instance, children were told not to worry about missing some items, since achievement tests are used at several different grade levels and thus may include items children had not yet learned how to solve. As in the standard condition, children did each complete subtest under test company time limit . Condition 4 (Combined Optimizing) combined the special instructions from condition 3 and the relaxed time limits from condition 2.

Results for the mathematics computation and reading comprehension subtests were analyzed in an Analysis of Variance, which included three levels of anxiety, two levels for sex, two levels for grade, and four levels for testing condition. Children present at both times of testing were the only ones included in the analysis. The dependent measures used were the number correct of the subset of items from each test done by children in all conditions. There were 24 such items from the mathematics computation subtest and 20 from the reading comprehension subtest.

The major result of the study was the significant three-way interaction of test anxiety, grade level and testing condition on the mathematics computation measure ($F = 2.835$, $df = 6/126$, $p = .013$), the means for which are presented in Figure 3. Seventh-grade children's scores show a strong interfering anxiety effect in the Standard condition. High anxious children scored

---

Insert Figure 3 about here

---

the lowest, middle anxious children achieved intermediate scores, and low anxious children scored highest. Performance of the low anxious children, in fact, is almost double that of high anxious children. In the Relaxed Time

Limits Optimizing condition, low and high anxious children showed some improvement while in the Difficulty Information Optimizing condition, performance of all three groups declined. In the combined Optimizing condition, low anxious children did very well, middle anxious children's performance showed some optimizing effects (+ 2.5 problems), but high anxious children's scores declined (- 2.3 problems). In summary, for seventh graders: (1) low test anxious students performed best in all conditions, (2) difficulty information alone did not aid any group's performance, and (3) optimizing performance tendencies were shown by high test anxious children with relaxed time limits and middle test anxious children in the combined optimizing condition.

Eighth-grade students' performance (see Figure 3) in the Standard condition showed the largest anxiety effect found in the study. Low anxious children achieved 100% accuracy in this condition, which is more than double the performance of high anxious children. Once again middle anxious children's scores fell between these two groups. In the Relaxed Time Limits Optimizing condition, both the middle and high anxious children showed strong optimizing effects, with each group gaining over five correct problems. In the Difficulty Information Optimizing condition, in contrast, middle and high anxious children performed at about the same level as they did in the Standard condition, whereas low anxious children's performance declined (- 6.5 problems). In the Combined Optimizing condition, low anxious children performed well, although not as well as they did in the Standard condition. Middle anxious children's performance showed some increase over their performance in the standard condition (+ 2.9 problems). High anxious children performed extremely well in the Combined Optimizing condition, showing a gain of nine problems correct

compared to the Standard condition. In fact, high anxious children actually did slightly better than the other two groups in this condition. In summary, for 8th graders: (1) low test anxious children did quite well in the Standard and Relaxed Time Limits conditions but less well when difficulty information was provided, (2) middle and high test anxious children showed strong gains in performance when relaxed time limits were introduced by themselves or in combination with difficulty information in the Combined Optimizing condition, and (3) difficulty information in its own right did not facilitate performance of any group and instead lowered performance of the less anxious students.

The present results demonstrate in a naturalistic testing situation how test anxiety and standard test company procedures debilitate some children's performance on achievement tests, and how this motivational test bias can be reversed. There is a clear linear negative relationship of anxiety to performance for both 7th and 8th graders, a finding that has been demonstrated in many other studies (see Hill, 1972; 1980). As in earlier optimizing studies the removal of time pressure had a strong effect in improving performance of middle and high anxious children. For 8th grade children, middle anxious children improved most in the Relaxed Time Limits condition. High anxious children improved in that condition and even more in the condition in which time limits were relaxed and difficulty information also provided. For 7th graders, results concerning relaxed time limits were similar, though somewhat weaker. In this case high anxious children improved most when time limits were relaxed, and middle anxious children improved most when relaxed time limits and difficulty information were combined. The general implication here is that the imposition of time pressure means that the competence of many children is being underestimated in achievement testing situations (see Hill, Wigfield, & Plass, 1980, see Appendix).

In summary, the research reviewed here suggests that time limits that induce time pressure is a feature of standardized testing that introduces motivational bias that prevents anxious students from showing what they have learned and the skills they have acquired. This work is particularly relevant to educational testing policy since most tests involve time limits of varying degrees of stringency and increasing time limits to reduce time pressure is a relatively easy and straight-forward change to make. We will turn to specific issues involved in changing time limits on standardized tests in the section on implications for educational testing policy after discussing cognitive demands of testing.

Cognitive Testing Demands Independent of Content

An increasing focus of our ongoing program of research concerns test instructions, response formats, answer forms and other aspects of achievement tests that place cognitive demands on the student completely independent of the achievement content being sampled. Such cognitive test demands can both interfere with performance directly if the child does not understand how to take the test (and quickly, if under time pressure) and indirectly by increasing interfering motivation dynamics such as test anxiety. At present our empirical work in this area is still in the development stage. Logical analysis from basic research on children's cognitive and motivational development and informal feedback from school personnel, however, suggest that cognitive test demands may be an important source of test bias for the high anxious-low performing student of central interest in this project. Our increasing interest in this area, in fact, has developed over the past several years directly out of discussions with teachers and school administrators concerned with testing and evaluation. School staff have repeatedly emphasized that aspects of achievement testing which are particularly difficult for

elementary school age children include the often complex and changing test instructions and question formats, and the introduction of computerized answer sheets at about the fourth grade level for many standard achievement tests. Children who have difficulty understanding instructions and using answer sheets should experience more anxiety in the test situation since they don't understand these important aspects of the test. They also should be more likely to give up, have difficulty proceeding effectively on a timed test, and in general, may not be able to answer problems they know because they are either confused about how to do a problem, don't know how to use the computerized answer sheets, or experience strong debilitating motivation. Older students may be better able to understand test instructions and answer sheets but still have trouble dealing with them effectively as time limits become more stringent at later ages.

Inspection of current standardized achievement tests reveals that cognitive and intellectual demands of the typical instructions, response formats, and answer sheets, independent of the material being examined, could readily lower further the performance of the high anxious already low performing student. For example, many achievement test instructions are fairly long and difficult to follow. Sample problems are not always given. The response format of sample problems given is not always the same as the response format of the actual problems. Children often have no practice test and are given only one or two practice problems on the computerized answer sheet. Sometimes sample problems are given but are not to be filled in on the computerized sheet. Some subtests have as many as half a dozen instructions introducing portions of the subtest, often with different response formats; at the same time, there may or may not be sample problems which are or are not worked out on the computerized answer sheets. After a brief practice problem, children

in grades 4-6 are often expected to read instructions and adapt to different response formats on their own as they proceed through the test under testing pressure. The (younger) 4th graders in particular should have trouble dealing with these demands. Given this myriad of non-content related possible stumbling blocks in many tests, we strongly expect that high anxious students with a history of scoring far below norm on standardized tests will be most debilitated by these factors.

A collaborative school-university pilot project in this area involved nine elementary school teachers giving a standardized achievement test to 4th through 6th grade children as part of an evolving school testing program. In this pilot activity, the teachers administered practice tests with the same instructions and the actual sample problems included with the test (but none of the actual test problems) for up to seven of the subtests in the language arts and mathematics achievement subtests to be given subsequently. Some teachers chose to go over one such practice test carefully, others chose to go over between three and seven. The teachers also talked to the students about the general purposes of the testing, explained that taking tests is one of the things students need to learn how to do, and provided some information on test taking strategies.

The purpose of this practice testing was to familiarize the students with the test, to be sure they understood the instructions, and to give them experience with question and answer formats as well as the computerized answer sheets while in no way teaching the content of the test itself. This ongoing pilot activity was designed to develop procedures and to obtain some initial information on how well the procedures are working. Teacher feedback indicates the practice session with the instructions and answer sheets seemed to help many children in terms of how to take the test. Children had far

fewer questions about the instructions or use of the answer sheets during the test than in previous years, began working the test problems more quickly and with apparently little confusion about how to do the problems, and seemed to progress smoothly through the different subtests. In particular, the anxious students who often are weary and give up in standard achievement tests appeared to have less difficulty than usual with how to do the test and to have worked hard during the tests.

The pilot work suggests that this new kind of classroom activity may be successful in identifying and correcting for another aspect of standard achievement test procedures which allows motivational test bias to operate as well as directly lowering test performance. We plan to continue working with this school's staff in the coming years to more fully develop and integrate such procedures into the school's teaching and testing programs and to evaluate their effects on motivation, test taking strategies, and test performance.

IV. Implications for Educational Testing Policy

General Comments

We will conclude this final report by discussing the major implications of this grant supported research on motivational test bias for classroom teaching and educational testing policy (see Hill, 1980, Appendix, for further discussion). Some of the specific implications of the work for teaching and testing have been discussed earlier and will be treated here briefly only for purposes of emphasis or to illustrate general goints.

Hill (1980, see Appendix) has noted that the achievement test situation is often artificial in the sense that many aspects of the test and the testing conditions are unfamiliar to the student, being quite different from classroom activities. At the elementary school level, at least, standardized tests often differ markedly even from classroom tests. It is this very artificiality of the standardized test situation, however, which makes possible first, careful study of the interactive effects of motivation and testing conditions in determining performance and, second, recommendations for specific changes in teaching and testing practices based on empirical research. In most areas of educational policy, recommendations are, of course, often far removed from data due to the complexity of the phenomenon. Educational testing policy may be one of the few important areas in education allowing for fairly substantial and fairly direct ties between research data and policy recommendations.

Assessment of Motivation in Testing Programs

One clear and specific recommendation from the extensive research on motivation and test performance reviewed here is the desirability of incorporating motivational indices into building, school district, state, and national achievement testing programs. This allows for assessment of

relationships between motivation and test performance which would test for the presence of motivational test bias, either in general or for students of certain ages, sociocultural backgrounds, educational experiences, etc.

The collaborative project between the Illinois Office of Education and the University of Illinois, Urbana-Champaign, referred to earlier (see Harnisch, Hill, & Fyans, 1980, Appendix) demonstrates the feasibility and usefulness of such a measurement effort at the state level. That research has produced 7- and 14-item forms of the relaxed test anxiety scale, which take only five to ten minutes to administer in grade 4 and less than five minutes in grade 11, and which may be quite useful as motivational measures. These shortened motivational measures make assessment of motivational test bias in achievement testing programs even more efficient and feasible. The need for such data is particularly critical in new minimal competency programs in which the potential for interfering motivational effects is particularly high due to the strong consequences of failure.

Modifications in Testing Procedures

The grant supported research reviewed earlier suggests a number of ways (achievement) testing practices can be modified to minimize or eliminate motivational dynamics which interfere with test performance and result in an underestimate of the skills a student possesses and other forms of achievement. We will comment briefly on several of the testing parameters showing greatest promise in terms of reducing motivational test bias.

There is considerable research data pointing to time pressure as an aspect of achievement/educational testing which interferes with the performance of high test anxious students more than that of other students. Discussions with teachers and other school staff also frequently point to time limits and potential time pressure as an important source of anxiety and other negative

motivational tendencies. Studies reviewed earlier suggest that the removal of time limits often results in dramatic increases in the performance of high anxious-low performing students, indicating that they know the material being tested but experience motivational or other test taking problems under standard testing conditions.

It has been our experience testing elementary and junior high school students with a variety of achievement tests that increasing time limits between 50% and 100% allows nearly all children to finish a test comfortably. Since classroom teachers give many achievement tests, it is relatively easy and nondisruptive to have children who finish early under the longer time limits simply work at their desks on silent sustained reading or other materials. Standardized tests would have to be renormed, of course, if longer time limits are used. But these norms might be initially developed during pilot testing of new items, content areas, and the like of the tests. Such testing would also provide useful data on the effects of the new time limits (especially if motivational measures were collected, too). The cost of renorming tests and the longer testing sessions would be justified by the more valid scores resulting from the removal of time pressure and the accompanying motivational test bias.

There is also extensive evidence that failure, especially repeated failure, further lowers the performance of children showing a pattern of negative motivation and low test performance--for example, children a year or more below norm on a standardized test. The problem is compounded by the fact that students from various grade levels take the same achievement test (4th through 6th graders, 5th through 8th graders, etc.). It seems inexcusable from what we know about motivation to expose upper elementary grade children who are performing well below norm to a test given to students

two or three grade levels above their own. This virtually guarantees almost total failure, strong negative motivational dynamics, and a test score with little meaning.

There are several possibilities for dealing with the effects of repeated failure. A simple one is to give students information about the difficulty level of the test, what grade levels of students take the test, that all students are not expected to get all of the questions correct, etc. A second strategy is to bracket the difficulty level of the test around the student's current level of functioning. Students typically scoring well below norm could be given tests usually taken by younger students, and perhaps students typically scoring well above norm could be given somewhat more advanced tests. At a minimum, tests could be given that are developed for each grade level in reading, mathematics, etc., at the elementary and junior high levels instead of being given to children in two, three, or four adjacent grade levels; this would eliminate the most serious mismatches in the student's ability level and the test difficulty level in current testing programs. Not all of the present standardized achievement tests, of course, are given to multiple grade levels.

The final testing parameter worthy of discussion here concerns testing instructions, response formats, and answer sheets used in standardized testing. Initial research results and extensive discussions with teachers and other school personnel suggests that these non-content cognitive demands of tests may be important determinants of motivational test bias. These effects may be strongest when the student first takes a standardized test, typically in the early elementary school grades, or when some new kind of demand is introduced, such as the use of computerized answer sheets about the fourth grade. The use of a full scale practice test given prior to the actual testing days

is recommended for the early and middle elementary school years. Such a test would expose children to the instructions, kinds of questions and answer formats, answer sheets, and possibly several sample problems in each area to subsequently be tested. This would help children avoid becoming confused about any of these testing parameters during the test, especially the high anxious-low performing child. Such test taking practices should be particularly helpful on tests with demanding time limits or on difficult tests, for which test pressure would be strong. A practice test also provides an opportunity for the teacher and students to discuss other aspects of testing reviewed here.

Development of New Testing Programs

It is recognized that much more data is needed on the effects of motivation on test performance, and it will take a good deal of time to develop new testing procedures and restandardize achievement tests in ways suggested here. In the meantime, one option in testing programs at the school building, district, and other levels is to develop a dual testing program in which students are tested twice, once under standard testing conditions and once under optimizing testing conditions. Order of testing, of course, would have to be examined and controlled for through counter-balanced test-retest designs. For simplicity of presentation, we will consider the case here where all children take an achievement test under standard conditions first and some or all students retake the test under optimizing conditions second (with test-retest control groups).

Students to be tested in the optimizing testing condition might be chosen on the basis of motivation-performance patterns shown during the standard testing, teacher recommendations, a low performance cut-off, or other means. Here students might be given a full practice session, more time, more information about the test, a less difficult test, and be tested individually.

The main interest would be in whether students showed marked gains in the optimizing testing program over and above the standard test-retest performance gain; such a result would provide evidence, first, that the student knew more than shown during the standardized testing, and second, that the student had a motivational or test taking problem. Such a student should in particular benefit from teaching activities designed to help students master test taking skills and develop positive motivation in standard testing situations. Results from the optimal testing condition should also be most useful for the teacher in terms of diagnosing what children have learned and what their educational needs are. Such a dual testing program might initially focus on the high anxious-low performing student and eventually include other students if the optimal testing procedures prove effective and useful.

A dual testing program is particularly desirable for minimal competency testing programs. The very threat of failure which could lead to grade repetition, exclusion from desired courses, failure to graduate from high school, etc., should greatly enhance testing pressure and trigger strong negative motivational dynamics. Minimal competency tests which (especially for anxious students) can involve stringent time limits, complex instructions, fairly difficult materials, and other factors discussed here would further exacerbate interfering motivational dynamics. Since the high anxious-low performing student of central interest in this report is most likely to fail minimal competency tests, it seems particularly important that these tests be developed and given in ways which minimize motivational test bias. Otherwise students will fail because they are unable to show what they know under the particular testing conditions, <u>not</u> because they don't possess the competencies being measured. Again, we make the fundamental distinction between knowing

the material and being able to show that knowledge under certain (artificial) testing conditions.

Development of New Teaching Activities and Integrated Testing Programs

Our development of new teaching activities and classroom experiences to help children acquire test taking skills and positive test motivation are in the early stages and just a few comments will be made here. It seems clear on the one hand, that many of the behaviors the child brings to the achievement test situation come from classroom experiences. On the other hand, it has also been suggested that the standardized achievement test situation differs in a number of ways from classroom testing situations, especially for elementary school children. One way to teach children skills to cope with demands of standardized testing, then, is to slowly introduce these demands into the classroom (testing) activities over the elementary school years as the teacher shows the student how to deal with them. Taking time pressure as an example, young elementary school children might always be given plenty of time to do workbook assignments that are closest to tests (assuming that the children stay on task). Time limits can be gradually introduced to classroom tests as students learn over dozens of classroom experiences that they may not be able to finish a test no matter how hard and efficiently they work. Children can be taught to persist, to work as quickly as possible without undue errors, and to derive satisfaction from doing their best (and not necessarily finishing a test and doing all of the problems). In effect, the teacher is teaching children how to cope with and function effectively under time pressure and to accept whatever performance level results from maximal, appropriate effort.

In a similar manner, teachers can gradually introduce and teach children how to deal with difficult--sometimes impossible--problems on tests,

with complex instructions and answer sheets, with competition and social comparisons, and with other aspects of testing which mediate motivational test test bias. The research supported by this grant has led us to the point that we can now develop a coordinated classroom teaching-educational testing program that further reduces motivational test bias and leads to optimal test performance and school achievement.

V. References

Atkinson, J. W. An introduction to motivation. Princeton: Van Nostrand, 1964.

Atkinson, J. W., & Feather, H. T. A theory of achievement motivation. New York: Wiley, 1966.

Atkinson, J. W., & Raynor, J. O. Motivation and achievement. Washington, D. C.: J. H. Winston, 1974.

Coleman, J. S., Campbell, E. O., Hobson, C. J., McPartland, J., Mood, A. M., Weinfeld, F. D., & York, R. L. Equality of educational opportunity. U. S. Department of Health, Education, and Welfare. Washington, D. C.: U. S. Government Printing Office, 1966.

Crandall, V. C. Achievement behavior in young children. In W. W. Hartup & Smothergill (Eds.), Young Child. Washington, D. C.: Association for the Education of Young Children, 1967, 165-186.

Dusek, J. B., & Hill, K. T. Probability learning as a function of sex of the subject, test anxiety, and percentage of reinforcement. Developmental Psychology, 1970, 3, 195-207.

Dweck, C. S. The role of expectations and attributions in the alleviation of learned helplessness. Journal of Personality and Social Psychology, 1975, 31, 674-685.

Dweck, C. S. Learned helplessness and negative evaluation. UCLA Educator, 1977, 19, 44-49.

Eaton, W. O. Profile approach to longitudinal data: Test anxiety and success-failure experiences. Developmental Psychology, 1979, 15, 344-345.

Feld, S. C., & Lewis, J. The assessment of achievement anxieties in children. Achievement-Related Motives in Children, 1969, 151-199.

Harnisch, D., Hill, K. T., & Fyans, L. J., Jr. Development of a shorter, more reliable, and more valid measure of test motivation. 1980, pre-publication paper, see Appendix).

Hill, K. T. Anxiety in the evaluative context. In W. W. Hartup (Ed.), Young Child. Washington, D. C.: National Association of the Education of Young Children, 1972, 2, 225-263.

Hill, K. T. Individual differences in children's response to adult presence and evaluative reactions. Merrill-Palmer Quarterly, 1976, 22, 99-104.

Hill, K. T. The relation of evaluative practices to test anxiety and achievement motivation. UCLA Educator, 1977, 19, 15-21.

Hill, K. T. Motivation, evaluation, and educational testing policy. In L. J. Fyans, Jr. (Ed.) Achievement Motivation: Recent Trends in Theory and Research. New York: Plenum, 1980, in press, see Appendix.

Hill, K. T., & Eaton, W. O. The interaction of test anxiety and success/failure experiences in determining children's arithmetic performance. Developmental Psychology, 1977, 13, 205-211.

Hill, K. T., & Sarason, S. B. The relation of test anxiety and defensiveness to test and school performance over the elementary-school years: a further longitudinal study. Monographs of the Society for Research in Child Development, 1966, 31, No. 2 (Serial No. 104).

Hill, K. T., Wigfield, A., & Plass, J. Effects of different kinds of optimizing instructions on seventh- and eighth-grade children's achievement test performance. 1980 pre-publication paper, see Appendix.

Jencks, C., Smith, M., Acland, H., Bane, M. J., Cohen, D., Gintis, H., Heyne, B., & Michelson, S. Inequality: A Reassessment of the Effect of Family and Schooling in America. New York: Harper & Row, 1973.

Maehr, M. L. Turning the fun of school into the drudgery of work: The negative effects of certain grading practices on motivation. UCLA Educator, 1977, 19, 10-14.

Plass, J., & Hill, K. T. Optimizing children's achievement test performance: The role of time pressure, evaluation anxiety, and sex. 1980, pre-publication paper, see Appendix.

Ruebush, B. K. Anxiety. In H. W. Stevenson (Ed.), Child Psychology Yearbook for the National Society of the Study of Education, 1963, 62, 460-516.

Sarason, S. B., Davidson, K. S., Lighthall, F. F., Waite, R. R., & Ruebush, B. K. Anxiety in elementary school children: A report of research. New York: Wiley, 1960.

Sarason, S. B., Hill, K. T., & Zimbardo, P. G. A longitudinal study of the relation of test anxiety to performance on intelligence and achievement tests. Monographs of the Society for Research in Child Development, 1964, 29, No. 7 (Serial No. 98).

Shea, B. M. Schooling and its antecedents: Substantive and methodological issues in the status attainment process. Review of Educational Research, 1976, 46, 463-[illegible]6.

Smith, C. P. Achievement-related Motives in Children. New York: Russell Sage, 1969.

Spielberger, C. D. Anxiety: Current Trends in Theory and Research. New York: Academic Press, 2, 1972.

Weiner, B. An attributional approach for educational psychology. In L. S. Shulman (Ed.), Review of Research in Education, 4. Itasca, Illinois: F. E. Peacock, 1977.

Willig, A., Harnisch, D., Hill, K. T., & Maehr, M. L. Sociocultural and Educational correlates of success-failure attribution in the school setting. 1980, pre-publication paper, see Appendix.

Zigler, E., Abelson, W. D., & Seitz, V. Motivational factors in the performance of economically disadvantaged children on the Peabody Picture Vocabulary Test. Child Development, 1973, 44, 294-303.

Zigler, E., & Harter, S. The socialization of the mentally retarded. In D. A. Goslin (Ed.), Handbook of Socialization Theory and Research. Chicago: Rand McNally, 1969.

VI. Appendix

(Contents of Appendix)

List of Tables

Table 1. Correlations between test anxiety and arithmetic test performance with defensiveness partialled out for black, white, and hispanic students in the general education and bilingual programs in the ongoing Hill-Maehr project (Total N = 365 students)

Table 2. Rate by accuracy distributions for each test anxiety group in each time limit condition in Plass and Hill study

List of Figures

Figure 1. Performance as a function of test anxiety and time pressure induced success/failure experiences

Figure 2. Means determining significant ($p < .001$) triple interaction among test anxiety, time pressure condition, and sex in Plass and Hill study

Figure 3. Mathematics computation test performance as a function of test anxiety, test condition, and grade level

Full Length Papers from Grant (attached to first 5 copies of report)

Hill, K. T., & Eaton, W. O. The interaction of test anxiety and success/failure experiences in determining children's arithmetic performance. Developmental Psychology, 1977, 13, 205-211.

Nottelmann, E. D., & Hill, K. T. Test anxiety and off-task behavior in evaluative situations. Child Development, 1977, 48, 225-231.

Hill, K. T. The relation of evaluative practices to test anxiety and achievement motivation. UCLA Educator, 1977, 19, 15-21.

Hill, K. T. Motivation, evaluation, and educational testing policy. In L. J. Fyans, Jr. (Ed.) Achievement Motivation: Recent Trends in Theory and Research. New York: Plenum, 1980, in press.

Willig, A., Harnisch. D., Hill, K. T., Maehr, M. L. Sociocultural and Educational Correlates of Success-Failure Attribution and Evaluation Anxiety in the School Setting, 1980, pre-publication paper.

Harnisch, D., Hill, K. T., & Fyans, L. J., Jr. Development of a Shorter, More Reliable, and More Valid Measure of Test Motivation. 1980, pre-publication paper.

Plass, J., & Hill, K. T. Optimizing Children's Achievement Test Performance: The Role of Time Pressure, Evaluation Anxiety, and Sex. 1980, pre-publication paper.

Hill, K. T., Wigfield, A., & Plass, J. Effects of Different Kinds of Optimizing Instructions on Seventh- and Eighth-Grade Children's Achievement Test Performance. 1980, pre-publication paper.

Table 1

Correlations between test anxiety and arithmetic test performance with defensiveness partialled out for black, white, and hispanic students in the general education and bilingual programs in the ongoing Hill-Maehr project (Total N = 365 students)

General Education Program				Bilingual Program	
Grade Level	White	Black	Hispanic	Born in Illinois	Other Students
Grades 4-6	-.33** (N=69)	-.14 (N=59)	-.08 (N=26)	-.58** (N=21)	-.36** (N=62)
Grades 7-8	-.36* (N=33)	-.41* (N=33)	-.93***[a] (N=8)	-.51* (N=18)	-.45** (N=36)

*p < .05

**p < .01

***p < .001

[a] -.93 is correct partial correlation; with N of only 8, grade 7-8 results for hispanic student in general education program are highly tentative although in the same direction as other (hispanic) groups

Table 2

Rate x Accuracy Distributions for each Test Anxiety Group in each Time Limit Condition in Plass and Hill Study

Time Pressure

% Correct	Low Anxious N = 25 (Rate)			Middle Anxious N = 23 (Rate)			High Anxious N = 27 (Rate)		
	Fast	Med.	Slow	Fast	Med.	Slow	Fast	Med.	Slow
High	1	9	1	1	2	0	0	1	0
Middle	1	10	1	4	6	6	1	10	7
Low	1	0	1	2	2	0	4	4	0

Without Time Pressure

% Correct	Low Anxious N = 27 (Rate)			Middle Anxious N = 25 (Rate)			High Anxious N = 28 (Rate)		
	Fast	Med.	Slow	Fast	Med.	Slow	Fast	Med.	Slow
High	0	12	3	0	4	2	0	5	1
Middle	0	8	1	0	6	11	1	8	5
Low	2	1	0	1	1	0	2	6	0

Figure 1

Performance as a function of test anxiety
and time pressure induced success/failure experiences

(Based on Figure 1, Hill and Eaton [1977], with the Y-axis inverted so that superior performance is at the top of the axis, consistent with other figures in this report.)

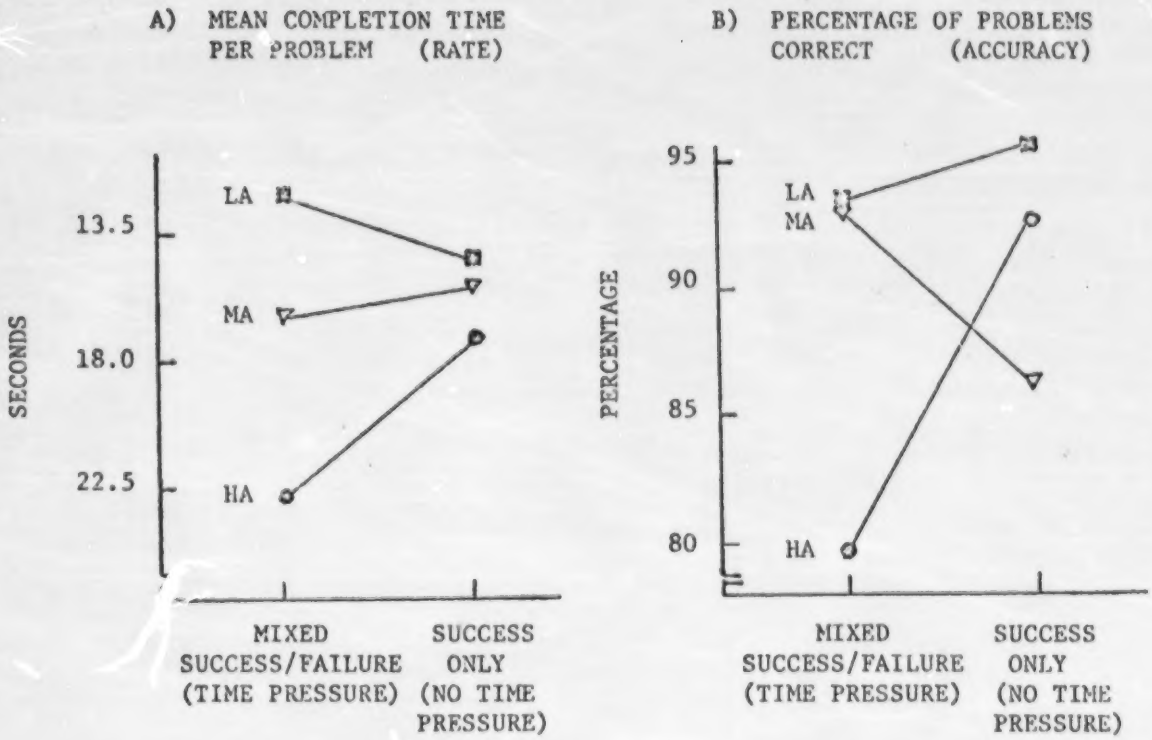

Figure 2

Means determining significant ($p < .001$) triple interaction among test anxiety, time pressure condition, and sex in Plass and Hill Study

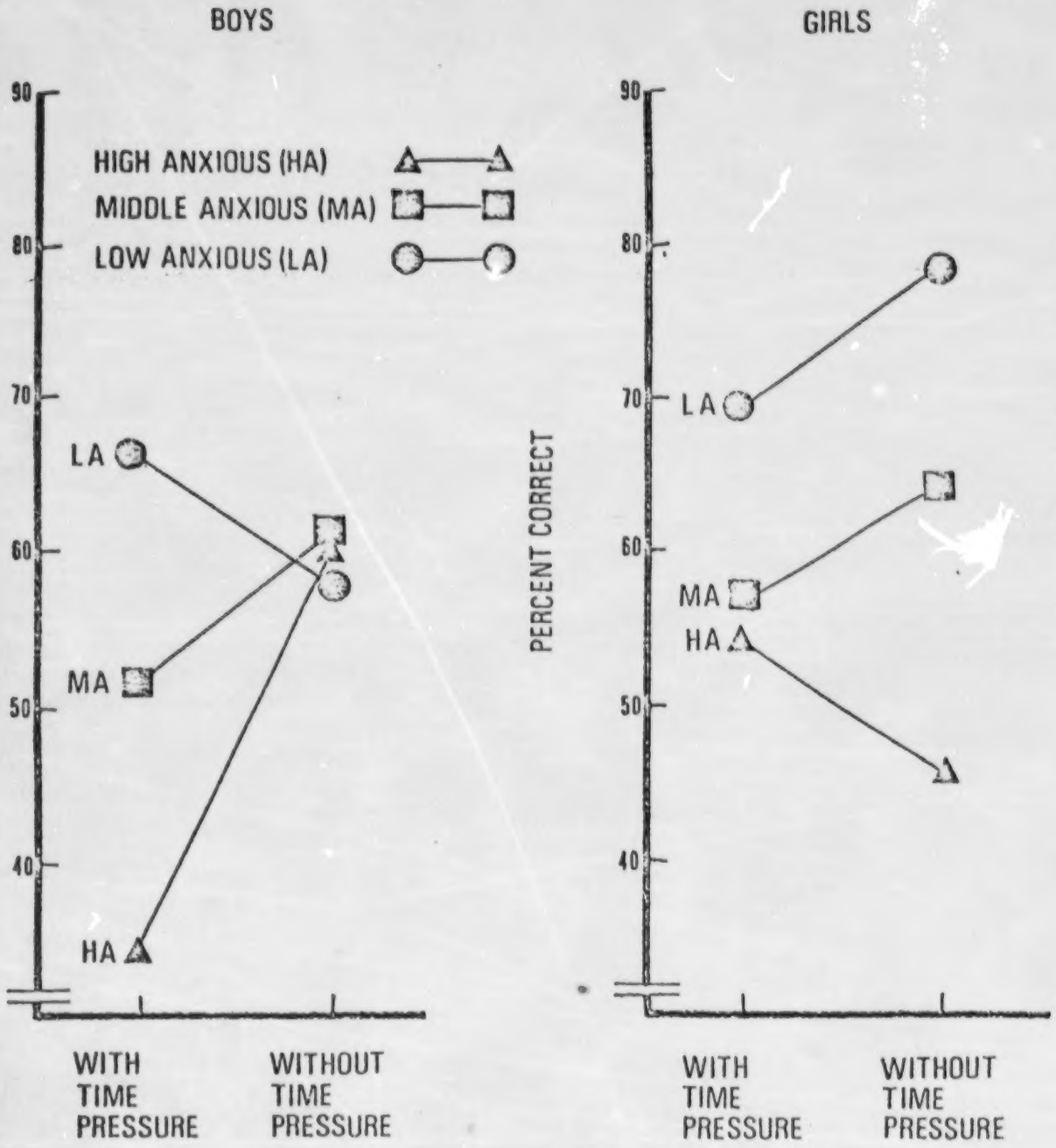

Figure 3

Mathematics Computation Test Performance as a Function of Test Anxiety, Testing Condition, and Grade Level